

IDEQ/EPA Comments and Issues – Unconfined (Free) Swell

- ***Only concern for slope stability or bearing capacity under point loading***
 - ***these conditions do not exist for EP lining system***
- ***Needle-punch reinforcing controls unconfined swelling***
 - ***shear strength is maintained (Fox 1998)***
- ***Non-woven geotextile limits/reduces bentonite migration (Stark 1997)***

IDEQ/EPA Comments and Issues - Freeze-Thaw Resistance

- ***Krause et al (1997) study was limited to 20 cycles***
 - ***Personal communication with Prof. Benson (supervised research)***
 - ***No physical/chemical mechanism observed for GCL to undergo k increase***
 - ***Should behave similarly for indefinite # of freeze-thaw cycles***
 - ***Number of freeze-thaw cycles in GCL bentonite significantly less than in ambient air temperature***
- ***Well-documented and widely accepted that GCLs are superior to CCLs with respect to freeze-thaw resistance***

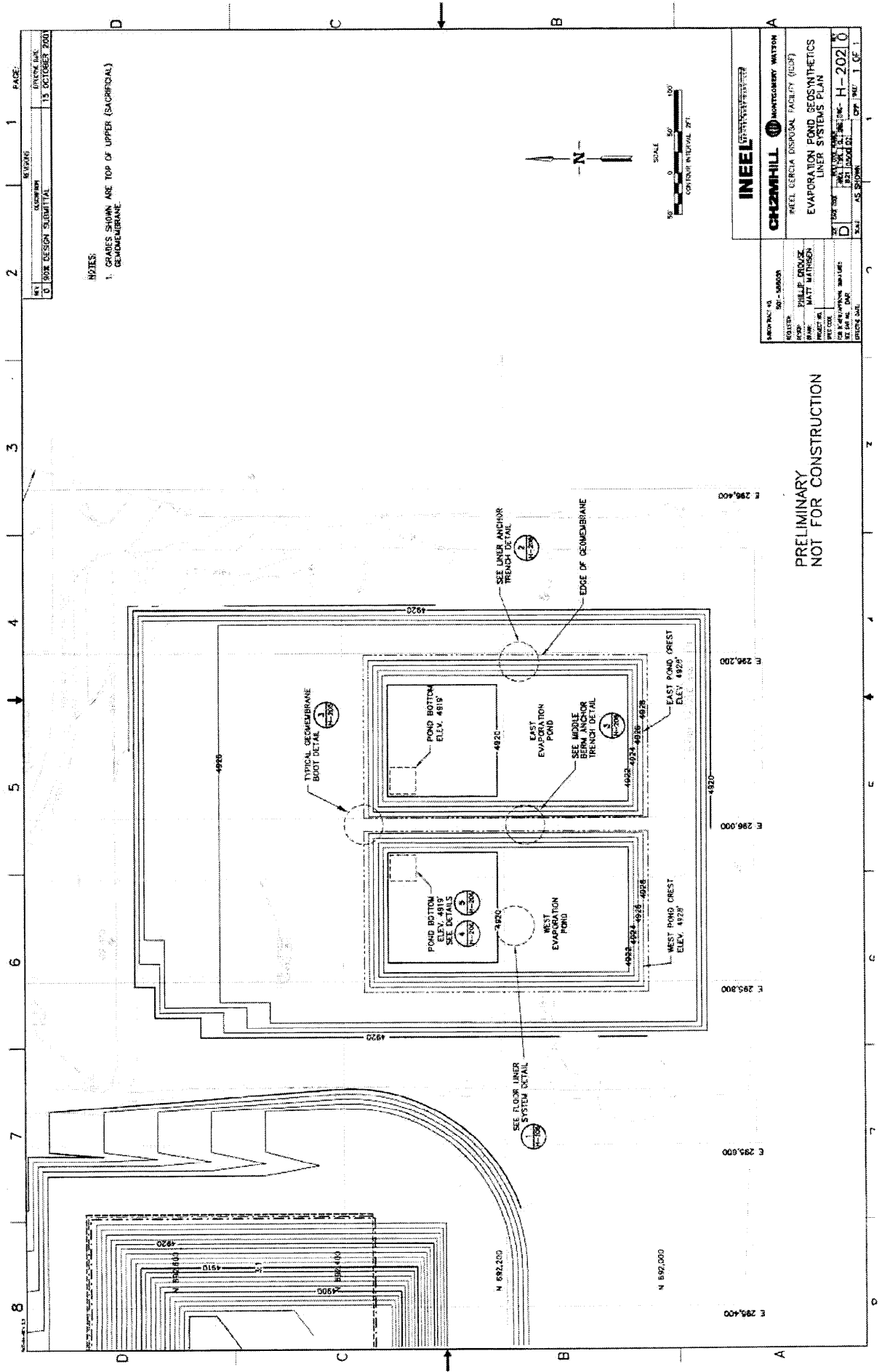
IDEQ/EPA Comments and Issues - Attenuation

- ***CCLs will develop microcracks when exposed to freeze-thaw cycles and attenuation capacity will be short-circuited***
- ***EPA Study on leakage rates for composite liners***
 - ***Composite liners with GCL outperform liners with CCL***

IDEQ/EPA Comments and Issues – HDPE as geomembrane material

- ***Considered in the liner industry to be the longest lasting, most protective liner material available***
 - ***excellent UV degradation resistance and low temp. brittleness.***
- ***Sacrificial HDPE geomembrane provided***
- ***GSE Forensic Study on HDPE liner exposed for 20 years in CO***
 - ***no significant reduction in primary physical properties***
- ***Hsuan et al. (1997) – 200 freeze-thaw cycles with no change in sheet and seam tensile properties***
- ***Proper liner design and installation can address thermal expansion and contraction issues***

Current Evaporation Pond Design



[illegible]

3 MIDDLE BERM ANCHOR TRENCH DETAIL

Summary and Conclusions

- ***Responses provided to address agency comment/issues***
- ***Alternative provides superior leakage protection***
- ***Alternative allows better access for leakage monitoring and repairs as needed***
- ***Alternative provides easier access for maintenance and repair***
- ***Alternative eliminates the operations layer and thus minimizes future waste generation***
- ***CETCO (GCL manufacturer) provided list of RCRA ponds with GCL in lining system (handout table)***